

What Is Claimed Is

General 1. A method for making a laminate nonwoven fabric comprising the steps of:

5 a) providing a first nonwoven layer on a moving support;
b) providing a second nonwoven layer; said second nonwoven layer overlying said first nonwoven layer on said moving support; and

10 c) pattern hydroentangling said first and second nonwoven layers to one another to form a laminate nonwoven fabric; said pattern hydroentangling comprising:

i) providing a first manifold having a plurality of jet orifices therein,

15 ii) conveying said moving support under said first manifold in a direction coincident with said machine direction; whereby streams of water from each of said individual jet orifices will be directed onto said first and second nonwoven layers to thereby laminate them to one another.

Fig 4 & 5 2. A method for making a laminate nonwoven fabric as in claim 1, wherein said step of moving said first manifold in a direction coincident with said machine direction comprises oscillating said first manifold in a substantially cross direction.

Fig 5 3. A method as in claim 1, further comprising:
25 a) providing at least a second manifold, said at least a second manifold having a plurality jet orifices therein;
b) conveying said moving support under said at least a second manifold in a machine direction while moving at least a first manifold in a direction coincident with said machine directions; whereby streams of water from each of said individual jet orifices from each of said first manifold and said second manifold will be directed onto said first and
30 second nonwoven layers to thereby laminate them to one another.

Fig 5 4. A method for making a nonwoven laminate fabric as in claim 3, further comprising the step of moving said at least a second manifold while conveying said moving support thereunder.

Fig 5 5. A method as in claim 3, further comprising the step of oscillating said first manifold while simultaneously oscillating said second manifold in an opposite direction, thereby laminating said first and second nonwoven layers in substantially zig-zagged pattern.

Gen 6. A method for making a laminate nonwoven fabric comprising the steps of:

10 a) providing a first nonwoven layer on a moving support;

b) providing a second nonwoven layer; said second nonwoven layer overlying said first nonwoven layer on said moving support; and

15 c) pattern hydroentangling said first and second nonwoven layers to one another to form a laminate nonwoven fabric; said pattern hydroentangling comprising:

20 i) providing a first manifold having a plurality of jet clusters therein; each of said jet clusters having a plurality of individual jet orifices therein; each of said individual jet orifices within each of said jet clusters separated from one another by a first distance that is greater than said first distance;

25 ii) conveying said moving support under said first manifold in a machine direction; whereby streams of water from each of said individual jet orifices will be directed onto said first and second nonwoven layers to thereby laminate them to one another.

Gen. 7. A method for making a laminate nonwoven fabric as in claim 6, wherein said second distance is at least twice said first distance.

30 Gen. 8. A method for making a laminate nonwoven fabric as in claim 6, wherein said second distance is at least 10 times said first distance.

9. A method for making a nonwoven laminate fabric as in claim 6, further comprising the step of moving said at least a first manifold in a direction coincident with said machine direction while conveying said moving support thereunder.

5 Figs 4 & 5 10. A method for making a laminate nonwoven fabric as in claim 9, wherein said step of moving said first manifold in a direction coincident with said machine direction comprises oscillating said first manifold in a substantially cross direction.

10 Figs 4 & 5 11. A method for making a nonwoven laminate as in claim 6, further comprising the step of moving said first manifold over said moving support in a first direction that is coincident with said machine direction at a first speed; and moving said first manifold back over said moving support in a second direction that is substantially opposite said first direction at a second speed that is different from said first speed.

15 Fig. 5 12. A method for making a laminate nonwoven fabric as in claim 6, further comprising:

a) providing at least a second manifold, said at least a second manifold having a plurality of jet orifices therein;

20 b) conveying said moving support under said at least a second manifold in a machine direction while moving said at least a first manifold in a direction coincident with said machine direction; whereby streams of water from each of said individual jet orifices from each of said first manifold and said second manifold will be directed onto said first and second nonwoven layers to thereby laminate them to one another.

25 Fig. 5 13. A method for making a nonwoven laminate fabric as in claim 12, further comprising the step of moving said at least a second manifold while conveying said moving support thereunder.

30 Fig. 5 14. A method as in claim 12, further comprising the step of oscillating said first manifold while simultaneously oscillating said second manifold in an

opposite direction, thereby laminating said first and second nonwoven layers in a substantially zig-zagged pattern.

Gen 15. A method as in claim 6, further comprising the steps of:

- 5 a) providing a third nonwoven layer overlying said second nonwoven layer on said moving support; and
- b) conveying said third nonwoven layer under said first manifold with said first and second nonwoven layers whereby said first, second, and third nonwoven layers are pattern hydroentangled to one another to form a laminate nonwoven fabric.

10 Gen 16. A method as in claim 15, wherein said first and third nonwoven layers each have a basis weight of between about 10 gm/m² and 35 gm/m², and said second nonwoven layer has a basis weight of between about 20 and 80 gm/m². ✓ 30 ✓ 20 ✓ 40 (30) ✓ 103

15 Gen 17. A method as in claim 15, wherein said first and third nonwoven layers each have a basis weight of between about 18 gm/m² and 24 gm/m², and said second nonwoven layer has a basis weight of between about 40 and 50 gm/m². ✓ 103 ✓ 133 42

20 Gen 18. A method as in claim 15, wherein said first and third nonwoven layers comprise viscose rayon with a basis weight of between about 18 gm/m²— and 24 gm/m², and wherein said second nonwoven layer comprises pulp with a basis weight of between about 40 and 50 gm/m².

25 Gen 19. A method as in claim 15, wherein said first and third nonwoven layers are hydroentangled with a jet energy between about 175 kj/kg and 1500 kj/kg.

Gen 20. A method as in claim 15, wherein said first, second, and third nonwoven layers are laminated to one another with an entanglement energy of between about 215 and 2000 kj/kg.

30 Gen 21. A method for making a laminate nonwoven fabric comprising:

a) hydroentangling a first nonwoven layer, said first nonwoven layer comprised of viscose rayon, said first nonwoven layer hydroentangled with an entanglement energy of between about 175

c) providing a third nonwoven layer having a basis weight of between about 10-35 gm/m², overlying said third nonwoven layer on said second nonwoven layer on said moving support; and

d) pattern hydroentangling said first, second, and third nonwoven layers to one another to form a laminate nonwoven fabric; said pattern hydroentangling comprising:

i) providing at least a first manifold having a plurality of jet grouping therein, each of said jet groupings having a plurality of individual jet orifices, said individual jets within one of said jet grouping separated from one another by at least a first distance; each of said jet groupings separated from one another by a second distance, said second distance at least twice said first distance;

ii) conveying said moving support under said first manifold in a machine direction, oscillating said at least a first manifold in a substantially cross direction whereby streams of water from each of said individual jet orifices will be directed onto said first, second and third nonwoven layers to thereby laminate them to one another.

23. A method as in claim 22, wherein said method further comprises:

a) providing a second manifold having a plurality of jet groupings therein, each of said jet groupings having a plurality of individual jet orifices, said individual jets within one of said jet groupings separated from one another by a second distance, said second distance at least twice said first distance; and

b) conveying said moving support under said at least a first manifold and second manifolds in a machine direction, moving said at least a first manifold and second manifolds in a machine direction, moving said at least a first manifold in a substantially cross direction and simultaneously moving said second manifold in a substantially cross direction opposite said first cross direction, whereby streams of water

from each of said individual jet orifices will be directed onto said first, second and third nonwoven layers to thereby laminate them to one another in a substantially criss-crossed pattern.